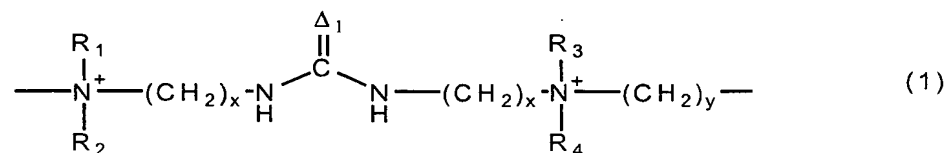


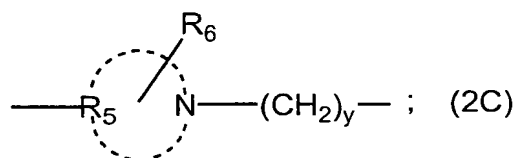
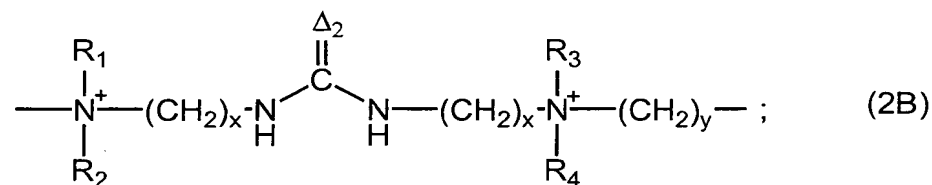
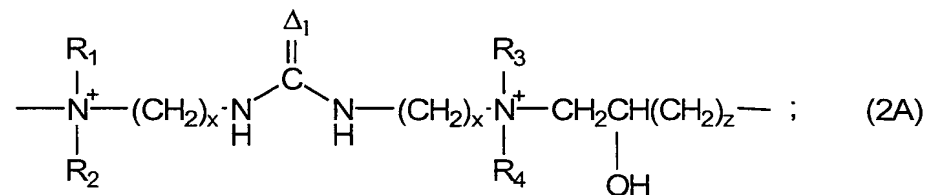
Having described the invention, the following is claimed:

1. A zinc or zinc alloy electroplating bath comprising:

zinc ions and a brightening agent, the brightening agent comprising at least one polyamine or a mixture of polyamines, the at least one polyamine or mixture of polyamines including a first repeating unit that has the general formula:



and a second repeating unit selected from the group consisting of

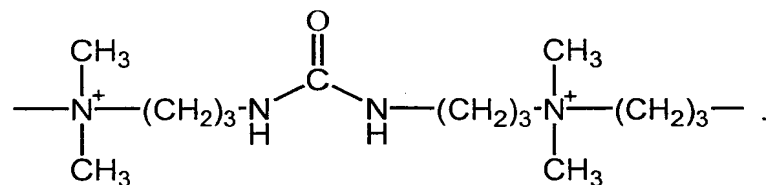


and combinations thereof;

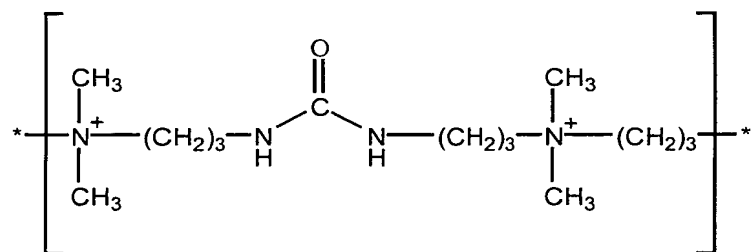
where  $\Delta_1$  is O, N, or S;  $\Delta_2$  is O, N, or S, and  $\Delta_2 \neq \Delta_1$ ; x is an integer from 2 to 6; y is an integer from 1 to 6; z is an integer from 1 to 6; R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub>, which is the same or different, is methyl, ethyl, isopropyl, n-propyl, hydroxyethyl, or

$-\text{CH}_2\text{CH}_2(\text{OCH}_2\text{CH}_2)_m\text{OH}$ ;  $m$  is a number between 0-6;  $\text{R}_5$  represents a group of atoms necessary to complete a heterocyclic compound having a five or six membered ring containing at least two nitrogen atoms; and  $\text{R}_6$  is nothing or an alkyl group.

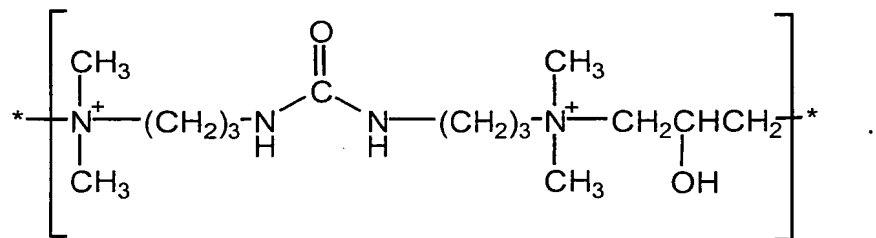
2. The zinc or zinc alloy electroplating bath of claim 1, the first repeating unit having the following formula:



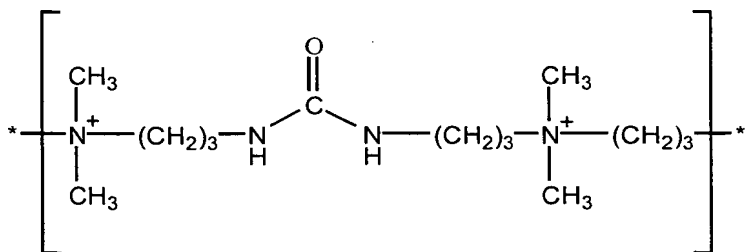
3. The zinc or zinc alloy plating bath of claim 1, the brightening agent comprising a mixture of polyamines, the mixture of polyamines including a first polyamine of the general formula:



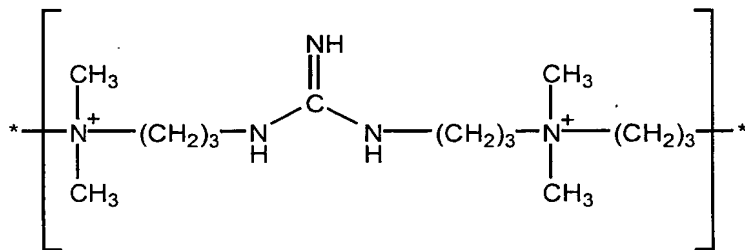
and a second polyamine of the general formula:



4. The zinc or zinc alloy plating bath of claim 1, the brightening agent comprising a mixture of polyamines, the mixture of polyamines including a first polyamine of the general formula:

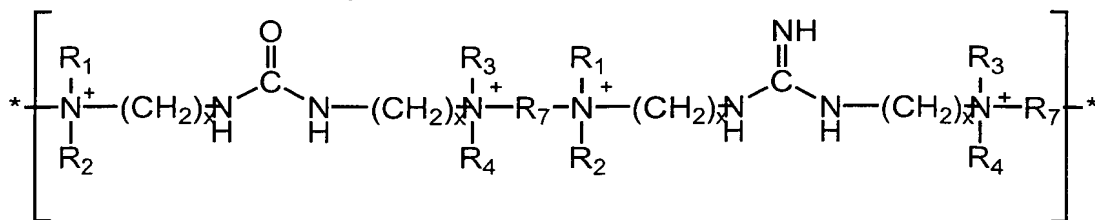


and a second polyamine of the general formula:



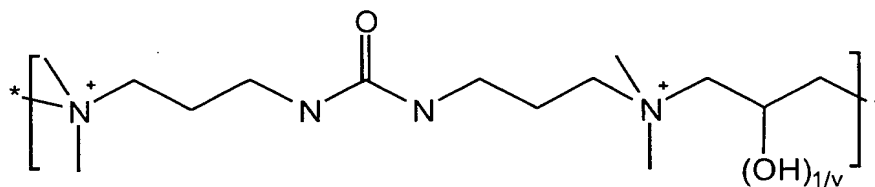
5. The zinc or zinc alloy electroplating bath of claim 1, the first repeating unit and the second repeating unit being in the same polymer chain.

6. The zinc or zinc alloy electroplating bath of claim 1, the polyamine having the following general formula:



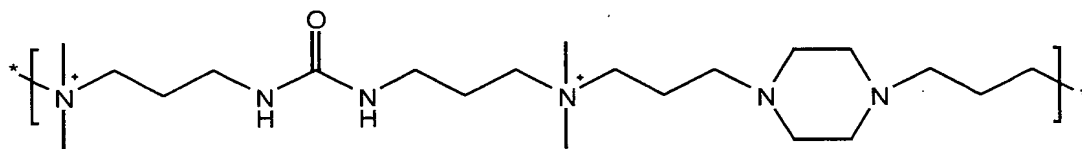
where R<sub>7</sub> is an alkylene group.

7. The zinc or zinc alloy electroplating bath of claim 1, the polyamine having the following general formula:

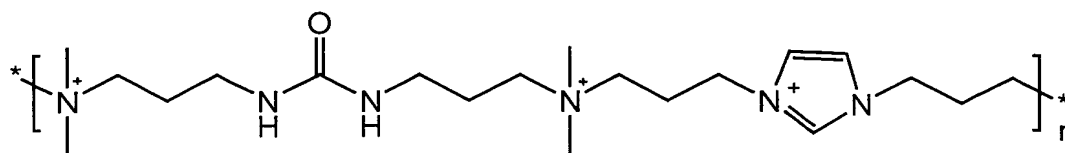


where v is an integer greater than 1.

8. The zinc or zinc alloy electroplating bath of claim 1, the polyamine having the following general formula:

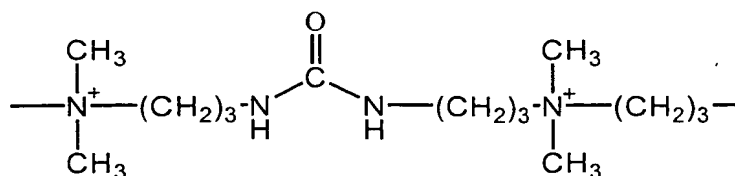


9. The zinc or zinc alloy electroplating bath of claim 1, the polyamine having the following general formula:

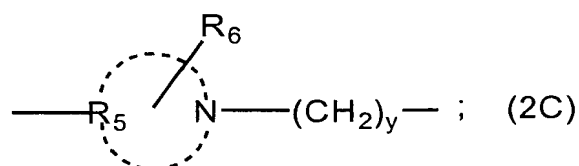
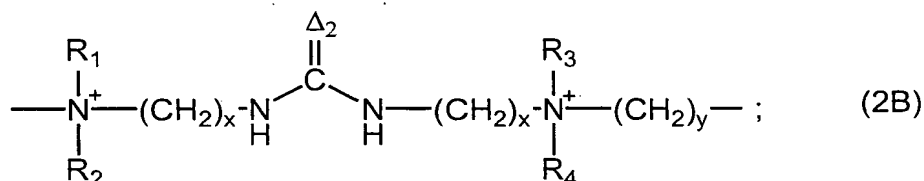
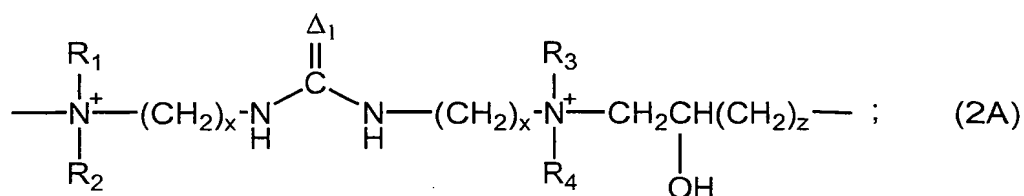


10. A zinc or zinc alloy electroplating bath comprising:

zinc ions and a brightening agent, the brightening agent comprising at least one polyamine or a mixture of polyamines, the at least one polyamine or mixture of polyamines including a first repeating unit that has the general formula:



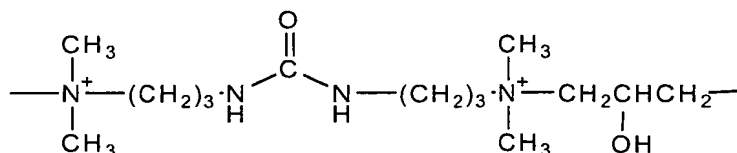
and a second repeating unit selected from the group consisting of:



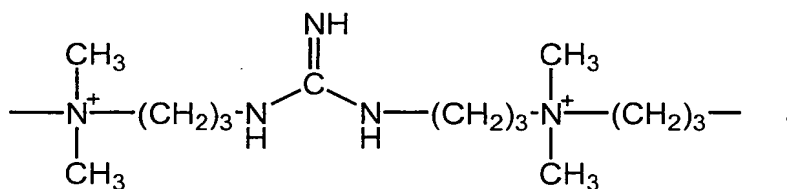
and combinations thereof;

where  $\Delta_1$  is O, N, or S;  $\Delta_2$  is O, N, or S, and  $\Delta_2 \neq \Delta_1$ ; x is an integer from 2 to 6; y is an integer from 1 to 6; z is an integer from 1 to 6; R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub>, which is the same or different, is methyl, ethyl, isopropyl, n-propyl, hydroxyethyl, or -CH<sub>2</sub>CH<sub>2</sub>(OCH<sub>2</sub>CH<sub>2</sub>)<sub>m</sub>OH; m is a number between 0-6; R<sub>5</sub> represents a group of atoms necessary to complete a heterocyclic compound having a five or six membered ring containing at least two nitrogen atoms, and R<sub>6</sub> is nothing or an alkyl group.

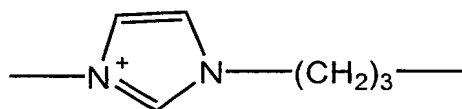
11. The zinc or zinc alloy electroplating bath of claim 10, the second repeating unit comprising:



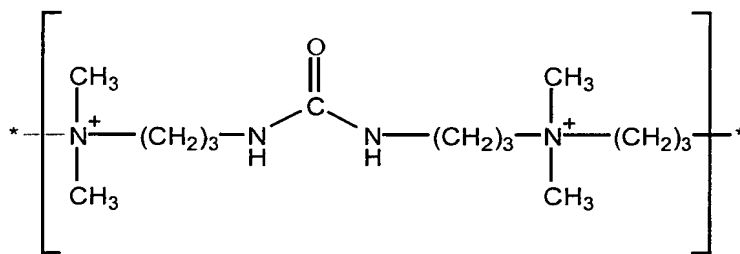
12. The zinc or zinc alloy electroplating bath of claim 10, the second repeating unit comprising:



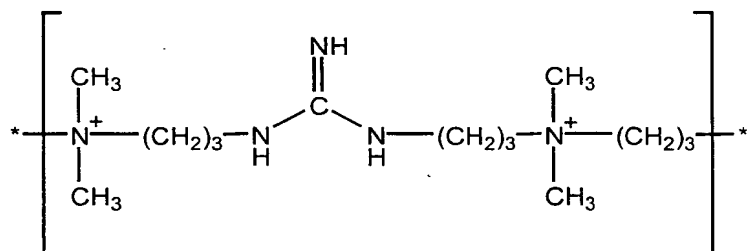
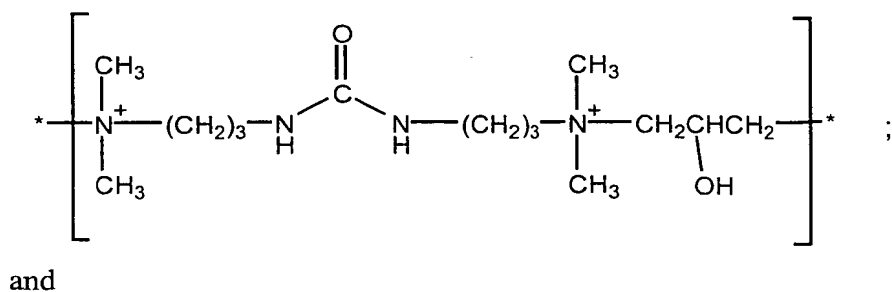
13. The zinc or zinc alloy electroplating bath of claim 10, the second repeating unit comprising:



14. The zinc or zinc alloy plating bath of claim 10, the brightening agent comprising a mixture of polyamines, the mixture of polyamines including a first polyamine of the general formula:

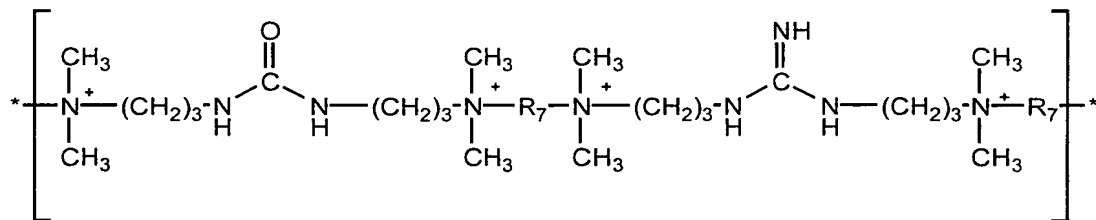


and a second polyamine selected from the group consisting of:



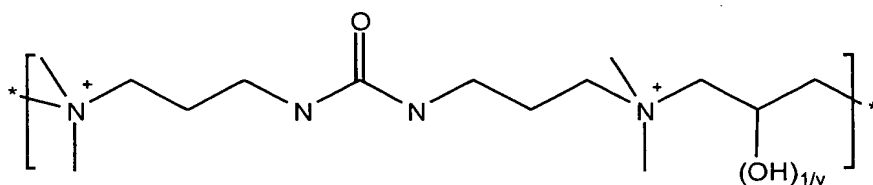
15. The zinc or zinc alloy electroplating bath of claim 10, the first repeating unit and the second repeating unit being in the same polymer chain.

16. The zinc or zinc alloy electroplating bath of claim 10, the polyamine having the following general formula:



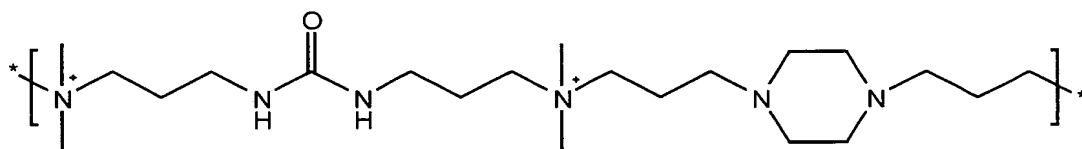
where R<sub>7</sub> is an alkylene group.

17. The zinc or zinc alloy electroplating bath of claim 10, the polyamine having the following general formula:

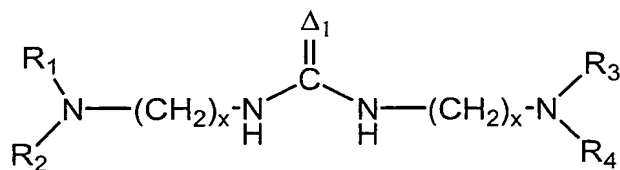


where v is an integer greater than 1.

18. The zinc or zinc alloy electroplating bath of claim 10, the polyamine having the following general formula:

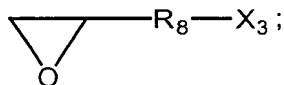
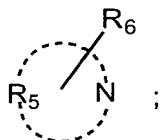
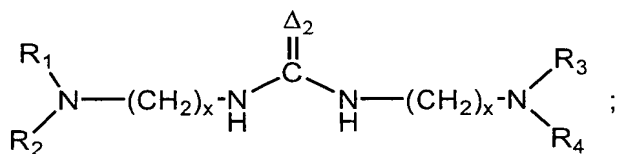


19. A brightening agent for an alkaline zinc or zinc alloy electroplating bath, the brightening agent comprising a copolymer of a first monomer having the following formula:



and a second monomer comprising at least two of the following compounds selected from the group consisting of:





where  $\Delta_1$  is O, N, or S;  $\Delta_2$  is O, N, or S, and  $\Delta_2 \neq \Delta_1$ ; x is an integer from 2 to 6;  $\text{R}_1$ ,  $\text{R}_2$ ,  $\text{R}_3$ , and  $\text{R}_4$ , which is the same or different, is methyl, ethyl, isopropyl, n-propyl, hydroxyethyl, or  $-\text{CH}_2\text{CH}_2(\text{OCH}_2\text{CH}_2)_m\text{OH}$ ; m is a number between 0-6;  $\text{R}_5$  represents a group of atoms necessary to complete a heterocyclic compound having a five or six membered ring containing at least two nitrogen atoms;  $\text{R}_6$  is nothing or an alkyl group;  $\text{R}_7$  and  $\text{R}_8$ , which may be the same or different, is an alkylene group; and  $\text{X}_1$ ,  $\text{X}_2$ , and  $\text{X}_3$ , which is the same or different, is a halogen.